

BEHAVIOR OF THE TUFTED TITMOUSE BEFORE AND DURING THE NESTING SEASON

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EXCEPT for the work of Laskey (1957) there is a lack of detailed life history information on the Tufted Titmouse (*Parus bicolor*). The present study includes new data on acoustic signals, general feeding, courtship feeding, copulation, and territoriality. Information was obtained from 25 March 1964, after the pairs had formed, until 22 May about the middle of the incubation period. Three pairs and several unmated males were observed from 1.3 to 5.5 hours per day on a random schedule in a dry deciduous woods in College Park, Maryland. Most birds were marked with strips of colored plastic about 1.5 inches long attached to their legs. Calls were recorded with a Uher model 4000-S tape recorder and a Electro-Voice model 644 (sound spot) microphone and the analysis was made with a Sonagraph Model Recorder.

ACOUSTIC SIGNALS

The calls of the titmouse can be divided into two groups, i.e., those with low frequencies between 2.0 and 2.7 kc and those with high-frequency components up to 9.5 kc (Fig. 1). During this study the females never produced low frequency calls except once just after being banded and released. Later in the season, when feeding the young in the nest, the female gave low frequency calls but they were lower in intensity than similar calls of the male.

The low frequency calls, with one exception, seem to be associated with all behaviors in approximately the same proportion. The one exception, Type B, was always given (one questionable instance) when feeding (Table 1). This call is probably the "*wheedleoh*" mentioned by Bent (1946). Therefore all other low frequency calls have been included under Type A call (Fig. 1). Although some slight variations are found, each kind of Type A call is constant in basic frequency pattern and time intervals. Several of them have low amplitude harmonics which have been assumed to have no function and are not shown in Figure 1.

The three calls (Type C, Chip and Squawk) which have high frequency components were usually associated with aggressive behavior. Type C was often followed by a series of Squawks. There may have been more than one type of Chip (Table 1). Those Chips associated with aggression were louder than those given at other times. These often were not heard unless one was close to the bird. The instances when Type C calls were emitted during other behaviors (Table 1) may have been influenced by my presence, but this did not seem to be the case.

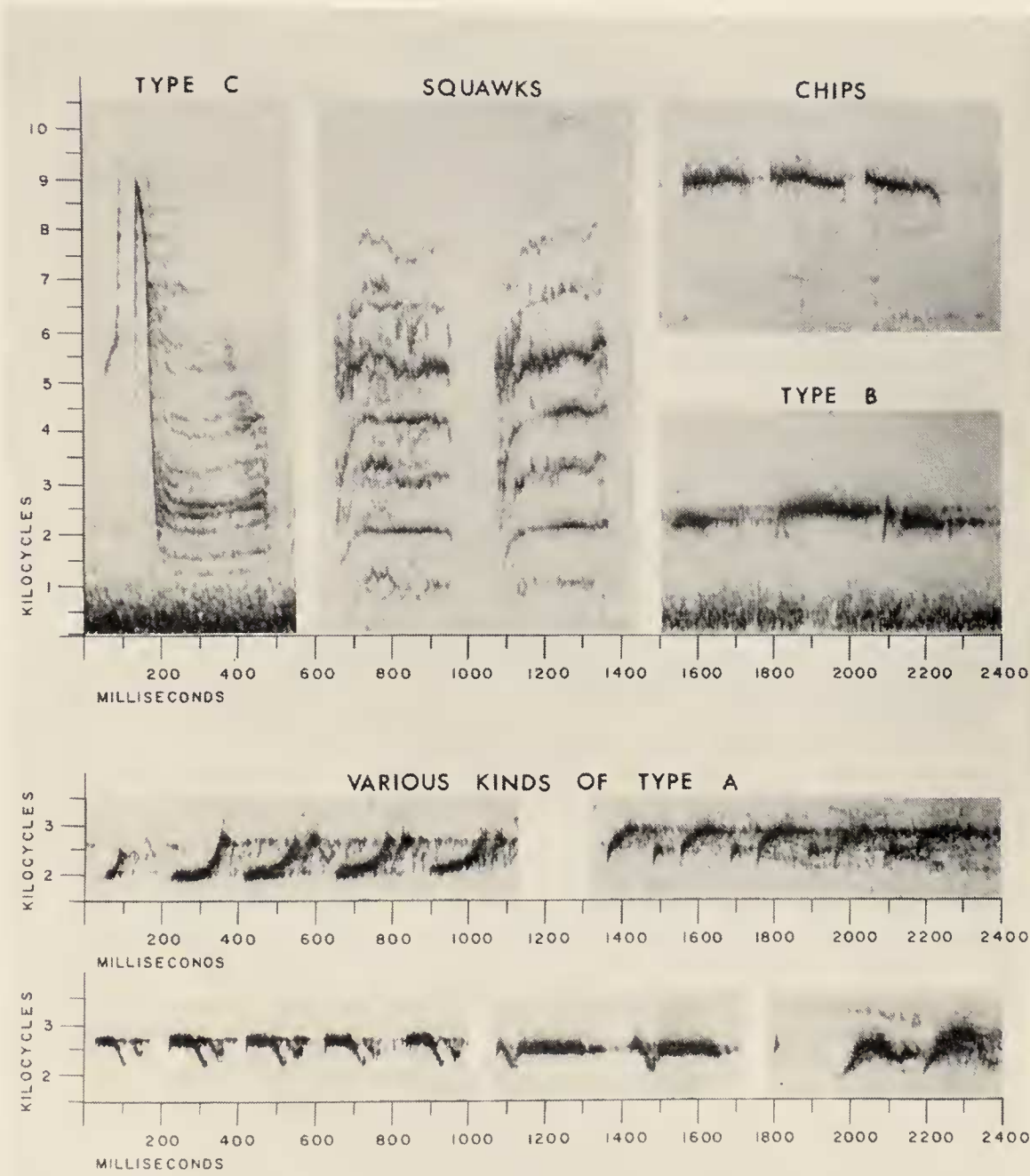


FIG. 1. Sonograms of the calls of the Tufted Titmouse.

FEEDING

The titmice occasionally fed at the end of a branch or on the trunk of the trees, but spent most of their time feeding along the branches between these two extremes. As the nesting season approached, the unmated males behaved very much as before, but the paired birds began to spend more time feeding closer to the ground (below 15 feet). They foraged on the ground

TABLE 1
BEHAVIOR ASSOCIATED WITH VARIOUS CALLS AND THEIR FREQUENCY OF OCCURRENCE

Behavior	Sex of bird	Types of Calls*				
		A	B	C	Chips	Squawks
Feeding	M	34	11	2	3	0
	F	0	0	0	0	0
Moving	M	3	0	1?	4	0
	F	0	0	0	8	0
Perched	M	6	0	0	1?	0
	F	0	0	0	0	0
Aggression toward observer	M	11	1?	6	2	3
	F	0	0	0	1	2
Aggression toward Titmice	M	18	0	10	8	6
	F	0	0	1	0	1
Pair interacting	M	4	0	0	3	0
	F	0	0	0	4	0
Male near nest	M	12	0	1	1	0

* See Figure 1 for sonograms of these calls.

and after finding food, ate it in the branches above the ground. When disturbed they emitted Chips or other aggressive calls and then flew to higher branches where Type A calls were produced by the male. On occasion, they would fly lower than 15 feet to a distant area while emitting Chips. Normally, when feeding close to the ground, they were quiet but on three occasions Chips were heard.

COURTSHIP FEEDING

Courtship feeding is the term used when the male feeds the female. As the male titmouse approached with food, the female usually began to vibrate her wings in a vertical direction close to her body (Laskey, 1957; Brackbill, 1949). Chips were sometimes emitted. The female usually continued the wing vibration during and sometimes after being fed.

Courtship feeding was first observed on 15 April which was the same day that nest building was first seen. Earlier the pair had come close together in a similar manner, but apparently no feeding occurred and the female did not vibrate her wings. As nest building continued, the number of feedings increased (Table 2). Before incubation had begun, six feedings were observed in 6 minutes. Three feedings occurred in close succession, and after the first feeding they appeared to be ritualistic, with no food being passed. The amount of feeding remained high through the incubation period.

TABLE 2
NUMBER OF COURTSHIP FEEDINGS BY TITMICE DURING THE BREEDING SEASON

Date	Stage of breeding	Number of feedings*	Hours of observation
25 March to 14 April	Before nest building	0.00	21.0
15 April to 19 April	Early nest building	0.41	14.5
20 April to 24 April	Late nest building	1.81	7.8
25 April to 2 May	Incubation	2.45	6.1

* Expressed in number of observations per hour of study.

COPULATION

Copulation was observed once at 12:30 PM on 18 April. The female emerged from the nest hole after nest building and flew toward the male who had been perched quietly 10 feet away. He moved a few feet and the female approached him twice more. After 20 seconds she began to vibrate her wings. This was apparently the same wing movement as was made during courtship feeding. After 16 seconds the male vibrated his wings for a couple of seconds and copulation occurred. No calls were heard as the distance from the observer was too great.

After incubation had started, mounting without copulation was observed in another pair at 7:00 AM on 2 May. The female had been off the nest for 3 minutes, had been fed twice by the male, and had also foraged for herself. The male approached and she began to vibrate her wings. She was fed but continued to vibrate her wings. She was immediately fed again (probably ritualistic) and continued to vibrate her wings. The male then mounted her, but did not copulate. During this time there were many Chips given, but the individual emitting them was unidentified.

TERRITORIES

The territory appeared to extend from about 15 feet above the ground to the treetops. Males infrequently sang below this height and almost all observed conflicts started above this level. An exception was noted when the intruder was close to the area of the nest, and here the territory probably extended to the ground. Most striking was the fact that the pair or unmated males went beyond their territory and under their neighbor's territory to feed for an extended time without incident. Perhaps this was possible because the neighbor did not know of the interloper's presence, as no calls except low Chips were emitted. or perhaps they were not in the other bird's territory but below it.

Before nesting, the defense of territory consisted mainly of vocal duels

TABLE 3
NUMBER OF CONFLICTS BETWEEN TITMICE DURING THE BREEDING SEASON

Stage of breeding	Types of conflicts*			
	Verbal	Circular	Contact	Wings vibrating
8-34 Days before nest building	0.37	0.07	0.00	0.00
7-0 Days before nest building	0.27	0.27	0.00	0.13
Nest building	0.09	0.04	0.04	0.22
Incubation	0.00	0.00	0.33	0.17
Total times observed	9	4	3	7**

* Expressed in number of observations per hour of study.
** Instances were noted when the ensuing conflict was not observed.

(Table 3) where the frequency of calling increased from the common 14 calls per minute to as many as 25 calls per minute. These were the same Type A calls that were given at other times (Table 1) and the individuals sometimes continued their search for food almost as before.

As the nesting season approached rival males sometimes came to within 2 or 3 feet of one another. High frequency calls were then rapidly uttered, and the birds flew in short rapid arcs around one another while keeping their distance (circular conflicts).

Later in the season physical contacts were observed. Once two males, with feet interlocked and wings beating vigorously, fell about 20 feet to the ground (see Bent, 1946). These conflicts and the circular ones were often preceded by one of the males crouching close to the branch with his body horizontal, vibrating his wings vigorously close to the body, and emitting Chips. The position was similar to that of the female during courtship feeding, but the female was more upright. A short time later, a few seconds to a few minutes, the male would fly quickly, without any undulations, toward his opponent. A conflict would then ensue or they would separate immediately.

DISCUSSION

As the breeding season approached, the unmated males behaved very much as before, but there was a marked change in the behavior of the paired birds. This was most discernible in the increased time which the pair spent feeding close to the ground. During the nesting season the females also ceased to give low frequency calls and the intensity of territorial conflicts increased.

The home range apparently extended below the neighboring bird's territory which appeared to occur from a height of about 15 feet to the treetops. Gibb (1956) states that the "territories of different *Parus* species overlap," but perhaps one could better picture the territory of the Tufted Titmouse as

a block of space situated upon a wider but thinner block, which is the home range. When the birds were in their home range, whether under their own or their neighbor's territory, there was almost no calling. This lack of calling may possibly explain the apparent disappearance of these birds after the start of nesting (Gillespie, 1930).

SUMMARY

Three pairs and several unmated male Tufted Titmice were marked and studied during a period from before nest building until after incubation had begun.

The most commonly heard calls are in the frequency range of 2.0 to 2.7 kc and are associated with most behavioral situations. Calls with frequencies up to 9.5 kc were usually associated with aggressive behavior. During the study, females did not give low frequency calls under normal circumstances.

During nesting and incubation, the paired birds spent most of their time feeding close to or upon the ground and not high in the trees as was the case before this period.

The amount of courtship feeding also increased during the nesting period and appeared to be ritualistic at times. The behavior of the female during courtship feeding may stimulate the male to mount her.

The territories appeared to be stratified with the home range below and extending beyond the territory and under the neighbor's territory. During the study period the main communication between males during defense of the territory changed from vocal interchanges to physical contact.

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LITERATURE CITED

- BENT, A. C.
1946 Life histories of the North American Jays, Crows, and Titmice. *U. S. Natl. Mus. Bull.*, 191.
- BRACKBILL, H.
1949 Courtship feeding by the Carolina Chickadee and Tufted Titmouse. *Auk*, 66: 290-292.
- GIBB, J.
1956 Territory in the genus *Parus*. *Ibis*, 98:420-429.
- GILLESPIE, M.
1930 Behavior and local distribution of Tufted Titmice in winter and spring. *Bird Banding*, 1:113-127.
- LASKEY, A. R.
1957 Some Tufted Titmouse life history. *Bird Banding*, 28:135-145.

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